

## Claims

1. A joint mechanism control apparatus having an actuator for generating a rotation torque whose level depends on a drive current, connecting a first link to a second link as freely rotating on an predetermined axis, and rotating the first link on the predetermined axis based on the rotation torque output from the actuator through an output axis of the actuator, characterized by comprising:

electric current detection means for detecting an electric current value of the drive current of the actuator; and

external force torque detection means for detecting a level of a torque by an external force applied to the output axis of the actuator based on the electric current value detected by said electric current detection means.

2. The joint mechanism control apparatus according to Claim 1,  
characterized by further comprising:

control means for controlling the actuator based on a detection result from said external force torque detection unit such that the external force applied to the output axis of the actuator can be removed.

3. The joint mechanism control apparatus according to Claim 1,  
characterized in that:

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cont.*

said actuator comprises:

a motor unit generating the rotation torque depending on a supplied drive current;

a torque amplification unit amplifying the rotation torque generated by said motor unit, and transmits the torque to said output axis; and

motor control means for controlling said motor unit by supplying said motor unit with the drive current at a level according to externally provided control information, and

said motor control unit is provided in said motor unit.

4. A joint mechanism control method having an actuator for generating a rotation torque whose level depends on a drive current, connecting a first link to a second link as freely rotating on an predetermined axis, and rotating the first link on the predetermined axis based on the rotation torque output from the actuator through an output axis of the actuator, characterized by comprising:

a first step of detecting an electric current value of the drive current of the actuator; and

a second step of detecting a level of torque by an external force applied to the output axis of the actuator based on the detected electric current value.

5. The joint mechanism control method according to Claim 4,  
characterized by further comprising:

a third step of controlling the actuator such that the torque  
by the external force applied to the output axis of the actuator  
can be removed based on a detected result obtained in said second  
step.

6. A robot device including a joint mechanism having an actuator  
for generating a rotation torque whose level depends on a drive  
current, connecting a first component to a second component as  
freely rotating on a predetermined axis, and rotating the first  
component on the predetermined axis based on the rotation torque  
output from the actuator through an output axis of the actuator,  
characterized by comprising:

electric current detection means for detecting an electric  
current value of the drive current of the actuator; and

external force torque detection means for detecting a level  
of a torque by an external force applied to the output axis of the  
actuator based on the electric current value detected by said  
electric current detection means.

7. The robot device according to Claim 6, characterized by  
further comprising:

control means for controlling said actuator such that the  
torque by the external force applied to the output axis of the

b actuator can be removed based on a detected result obtained in said external force torque detection means.

8. The robot device according to Claim 6, characterized in that :

said actuator comprises:

a motor unit generating the rotation torque depending on a supplied drive current;

a torque amplification unit amplifying the rotation torque generated by said motor unit, and transmits the torque to said output axis; and

motor control means for controlling said motor unit by supplying said motor unit with the drive current at a level according to externally provided control information, and

said motor control means is provided in said motor unit.

9. A robot device control method having a joint mechanism including an actuator for generating a rotation torque whose level depends on a drive current, connecting a first component to a second component as freely rotating on an predetermined axis, and rotating the first component on the predetermined axis based on the rotation torque output from the actuator through an output axis of the actuator, comprising:

a first step of detecting an electric current value of the drive current of the actuator; and

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a second step of detecting a level of a torque by an external force applied to the output axis of the actuator based on the detected electric current value.

10. The robot device control method according to Claim 10, characterized in that:

a third step of controlling the actuator such that the torque by the external force applied to the output axis of the actuator can be removed based on a detected result obtained in said second step.

11. A robot device having a pair of leg units in each of which a lower leg unit is connected to a thigh unit through a knee joint mechanism, and a foot unit is connected to the lower leg unit through an ankle joint mechanism, said foot units of said leg units are alternately touch a walking path such that a walking operation can be performed with the leg units are driven in a predetermined pattern, characterized by comprising:

an actuator, provided in said ankle joint mechanism, generating a rotation torque whose level depends on a drive current for rotation-driving said foot unit on a predetermined axis;

electric current detection means for detecting an electric current value of the drive current of the actuator; and

external force torque detection means for detecting a level of a torque by an external force applied to the output axis of the actuator based on the electric current value detected by said electric current detection means; and

control means for controlling the actuator based on a detection result from said external force torque detection unit such that the external force applied to the output axis of the actuator can be removed.

12. The robot device according to Claim 11, characterized in that:

said actuator comprises:

a motor unit generating the rotation torque depending on a supplied drive current;

a torque amplification unit amplifying the rotation torque generated by said motor unit, and transmits the torque to said output axis; and

motor control means for controlling said motor unit by supplying said motor unit with the drive current at a level according to externally provided control information, and

said motor control means is provided in said motor unit.

13. A method of controlling a robot device having a pair of leg units in each of which a lower leg unit is connected to a thigh unit through a knee joint mechanism, and a foot unit is connected

to the lower leg unit through an ankle joint mechanism, said foot units of said leg units are alternately touch a walking path such that a walking operation can be performed with the leg units are driven in a predetermined pattern, characterized by comprising:

a first step of detecting an electric current value of the drive current provided for an actuator, provided in said ankle joint mechanism, generating a rotation torque whose level depends on a drive current for rotation-driving said foot unit on a predetermined axis;

a second step of detecting a level of a torque by an external force applied to the output axis of the actuator based on the detected electric current value; and

a third step of controlling the actuator, based on a detection result obtained in said second step, such that the external force applied to the output axis of the actuator can be removed.

14. A joint device in which a first link is connected to a second link as freely rotating on a predetermined axis, comprising an actuator generating rotation torque for rotation-driving said first link on said predetermined axis, characterized in that said actuator comprises:

a motor unit generating the rotation torque; and  
motor control means for controlling the drive of said motor unit; and

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said motor control means is provided in said motor unit.

15. The joint device according to Claim 14, further comprising:  
torque amplification means for amplifying the rotation torque  
output from said motor unit, characterized in that  
said motor unit and said torque amplification means are  
incorporated into one unit.

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16. A robot device having a joint mechanism in which a first component is connected to a second component as freely rotating on a predetermined axis, comprising:

an actuator generating a rotation torque for rotation-drive said first component on the predetermined axis; wherein said actuator comprises:

a motor unit generating the rotation torque; and  
motor control means for controlling the drive of said motor  
unit characterized in that

said motor control means is provided in said motor unit.

17. The robot device according to Claim 16, further comprising a torque amplification means for amplifying the rotation torque output from said motor unit, characterized in that said motor unit and said torque amplification means are incorporated into one unit.

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